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AUTHOR Jenkins, Sarah; And Others
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ABSTRACT

An assessment was done of the Department of Education's (ED) approach to determining lender profitability for Guaranteed Student Loans. The assessment described the current net present value (NPV) method as well as discussing its strengths and weaknesses. The NPV method has been widely accepted for determining the profitability of different lending activities, including student loans. The approach is appealing because it accounts for all cash flows throughout the life of a loan as well as the opportunity cost of making a loan. This approach has also allowed lenders to evaluate the loan independently of other lending activities. In particular the assessment found that the ED model accurately determines lending profitability for this program, that it depends on a number of assumptions, that the appropriate discount rate is the lender's cost of capital adjusted for the relative riskiness of student loans compared to other types of lending, that assumptions used in ED's analysis erred on the side of understating lender profitability, that student loans could help insulate financial institutions from economic downturn, and that the analysis probably does not fully account for the relatively low level of liquidity and interest rate risk faced by lending institutions. Includes one table and five references. (JB)

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An Assessment of the Department of Education's Approach and Model for Analyzing Lender Profitability

Prepared by

Regional Financial Associates, Inc.

and

Sarah Jenkins,
Assistant Professor
George Washington University

Prepared for

Department of Education

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Table of Contents

Executive Summary 3

Present Value Approach to Assessing Lender Profitability 6

Strengths of the Present Value Approach 7

Weaknesses of the Present Value Approach 8

Suggestions For Improving ED's Model of Lender Profitability 11

The Cost of Funds 11

The Discount Rate 17

The Cost of Capital 17

The Risks of Student Lending 18

Direct Expenses of Maintaining a Student Loan Account 22

The Inclusion of Taxes 23

Appendix 1: Economies of Scale and Scope in the Banking Industry 25

Appendix 2: The Cost of Capital 27

Bibliography 29

Contributors 30

Executive Summary

The objective of this task is to evaluate the Department of Education's (ED's) approach to determine lender profitability for Guaranteed Student Loans. ED's analytic model of lender profitability for student loans is also assessed. The present value approach adopted by the Department of Education in its analysis is explained and its strengths and weaknesses discussed. The present value approach is a widely accepted method for determining the profitability of different lending activities, including student loans. The approach is appealing given that it accounts for all cash flows throughout the life of a loan as well as the opportunity cost of making a loan. The present value approach also allows lenders to choose loans that maximize shareholder's wealth, and it permits lenders to evaluate a loan independently of other lending activities.

The model developed by ED accurately determines lender profitability for Guaranteed Student Loans. The model depends on a number of assumptions that can significantly influence lender profitability, including the lender's cost of funds and the discount rate. The appropriate cost of funds is an average of the cost of funds derived using the weighted marginal cost of funds approach and the single source marginal cost of funds approach. The weighted marginal cost of funds

approach assumes that student loans are financed from a pool of funds available to the lender and that specific sources of funds are not directly related to specific uses of funds. This approach is most widely used by large institutions since the composition and cost of their incremental funds can be difficult to determine. The single source marginal cost approach assumes that student loans are funded with a specific liability. This approach is most often used by smaller lending institutions. Given that lending institutions of all sizes make student loans, an average of the cost of funds derived using the weighted marginal cost of funds and the single source cost of funds approaches should be used in ED's determination of lender profitability.

The appropriate discount rate to use in ED's model of lender profitability is the lender's cost of capital adjusted for the relative riskiness of student loans compared to other types of lending. The cost of capital is equal to the weighted average rate of return expected by providers of long-term funds to the lender. Student lending has a lower level of risk than other lending activities. Student loans have no credit risk or liquidity risk, relatively little interest rate risk, and a relatively small level of prepayment risk. The appropriate discount rate to be used in the present value calculation for determining the profitability of student lending is therefore less than the lender's cost of capital.

All the assumptions used in the Department of Education's analysis erred on the side of understating lender profitability. Economies of scale and scope in commercial bank issuance of liabilities and servicing student loans, for example, were not considered in the analysis. As discussed in Appendix 1, these economies can be substantial. The value of cross-marketing other loan products to student loan borrowers is also not accounted for in the analysis. Many student loan borrowers are likely to be good future credit risks as well as strong future mortgage and installment credit borrowers. The analysis also does not account for the possibility that student lending may reduce the total level of risk in a lender's portfolio. Since lending instituting face no credit risk when making a student loan, student lending could help insulate an institution from the deleterious effects of an economic downturn when the risk of default for most other lending activities is rising. Finally, the analysis probably does not fully account for the relatively low level of liquidity and interest rate risk faced by lending institutions when making a student loan. Sallie Mae's willingness to purchase student loans from lenders all but eliminates liquidity risk, and the adjustable rate on student loans limits any interest rate risk to lenders.

Present Value Approach to Assessing Lender Profitability

The Department of Education's model for analyzing lender profitability for guaranteed student loans is based on the present value approach. This is one of the accepted methods for assessing lender profitability. Other possible methods include the portfolio approach, the capital asset pricing model, and the option-pricing model. In the present value approach, the net present value (NPV) of a lending decision is equal to the present value of the cash inflows expected over the effective maturity of a loan (N) netted against the present value of the expected required cash outflows. This concept is reflected in the equation below, where r is the discount rate or required rate of return:

$$NetPresentValue = \sum_{t=0}^{N} \frac{C_t}{(1+r)^t}$$

Periodic cash flows (C_t) can be positive or negative, depending upon whether they are inflows or outflows.

Strengths of the Present Value Approach

A strength of the present value approach is its ease of interpretation. If the NPV of a lending decision is positive, the present value of the benefits of the decision are greater than the present value of the costs, and the lending institution expects to earn more than its minimum required rate of return. A loan with a positive NPV will therefore add to the existing value of the lending institution. If the NPV of the loan is negative, the opposite is true. If the NPV of the loan is zero, the lending institution is indifferent towards making the loan. The present value approach can also be used to compare the profitability of different loan types as long as the discount rates (the minimum required rate of return) used in the present value calculation appropriately account for the risks to the lender.

A second strength of the present value approach is that NPVs of alternative lending opportunities can be compared directly with one another because each NPV calculation explicitly considers the size and riskiness of each loan. Thus, if one loan has a NPV of $2,000, while another loan has an NPV of $1,500, a lender knows that the higher-NPV loan is expected to add more value to the institution, even if it costs more initially and is riskier. Although both loans are acceptable, the $2,000-NPV loan is more desirable.

A third strength of the present value approach is that it explicitly accounts for the timing of the income and expenses associated with a loan. This is especially important for student loans, where lenders are able to earn interest income early in the life of the loan, but defer the most significant expense (those expenses associated with a student loan default) until generally well after the repayment period of the loan begins.

Weaknesses of the Present Value Approach

An important weakness of the present value approach is that it fails to consider a loan in the context of an institution's entire portfolio of loans. The level of risk in a portfolio of loans can be significantly different than the sum of the risk levels of each loan type in the portfolio. When comparing two loans, the loan with the higher NPV may not be the optimal choice for the lending institution if the loan with the lower NPV has risk characteristics that improve the risk-return tradeoff for the institution's entire loan portfolio.

Ironically, given the risk characteristics of student loans, the present value approach may understate the value of student loans to many financial institutions. In other

words, a student loan may have a lower NPV than other loan types, but given its risk profile it may reduce the entire portfolio risk of the lending institution. A student loan may therefore be a more profitable loan for the institution than is suggested by its net present value. Since lending institutions face no credit risk when making a student loan, student lending could help insulate an institution from the deleterious effects of an economic downturn when the risk of default for most other lending activities is rising.

A second weakness of the present value approach is that a discount rate must be selected to determine the present value of a loan's cash flows. No single discount rate applies to all present-value decisions. The discount rate used to calculate an NPV should reflect the riskiness of the loan. Lenders are exposed to many risks, including interest rate risk, default or credit risk, prepayment or options risk, and marketability or liquidity risk. For the present value approach to provide an accurate measure of a loan's value to a lender, each of these risks (interest rate risk aside as this is accounted for in the assumption that lenders are match funding their lending activities) must be accounted for in the determination of the appropriate discount rate.[1]

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[1]For loans considered to be of average risk compared to the ongoing operations of the institution, the weighted average cost of capital is often suggested as the appropriate discount rate. Loans of below- or above-average risk should be discounted at a rate

A third weakness of the present value approach is that it does not explicitly account for non-interest and non-fee benefits accruing to lenders from making certain loans.[2] This weakness of the present value approach may also lead to an understatement of the value of student lending to many financial institutions. For example, the cross-marketing of other types of loan products to student loan borrowers could add significantly to the value of making a student loan. Student loan borrowers are likely to be good future credit risks as well as strong future mortgage and installment credit borrowers.[3]

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lower or higher than the cost of capital. There is no standard method for selecting the proper discount rate for loans that are not of average risk. A suggested method uses the Capital Asset Pricing Model, which equates the appropriate discount rate to the yield financial markets require on assets that are equivalent in risk to the loan under consideration. The CAPM approach requires estimating the beta coefficient of a loan, however, a difficult process that requires a large body of data. An alternative method involves selecting a discount rate based on measures of a loan's riskiness such as the standard deviation or coefficient of variation of the loan's cash flows. In practice, many institutions determine the discount rate subjectively, adjusting the discount rate up or down from the cost of capital depending upon management's assessment of the loan's risk. Using the present value approach opens the analysis to the criticism that an improper discount rate has been chosen.

[2]This weakness of the NPV approach is also a weakness of other measures of lender profitability.

[3]Based on data from the Survey of Consumer Finance, there is a strong correlation between income and education levels. Borrowers with greater levels of education should therefore have fewer credit problems and are more likely users of credit.

Suggestions For Improving ED's Model of Lender Profitability

The Department of Education's model of lender profitability accurately measures the net present value of Guaranteed Student Loans. The model does depend on a number of assumptions, however, that can significantly influence lender profitability, including the lender's cost of funds and the discount rate. A careful derivation of the cost of funds and discount rate is therefore necessary.

The Cost of Funds

There are two methods commonly adopted by lending institutions to determine their funding costs: the weighted marginal cost of funds (WMC) approach and the single source marginal cost approach. The WMC approach assumes that all assets are financed from a pool of funds and that specific sources of funds are not directly related to specific uses of funds. A derivation of the weighted marginal cost of funds for the entire commercial banking sector as of the first quarter of 1990 is

shown in the Table on Page 13.[4] The total marginal cost of a liability is equal to its interest cost, the non-interest costs of raising the liability, and the costs of holding reserves (if any) against the liability. The non-interest costs of collecting the liability can include among other things the cost of overhead, advertising outlays, and the cost of employee time to handle checks, servicing customer complaints, posting account information, and bidding for public funds. Estimates of these costs are available from the Functional Cost Analysis (FCA) collected by the Federal Reserve.[5] The weighted marginal cost of funds was 8.62%.

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[4]The WMC for lending institutions is determined by the following equation:

$$WMC = \sum_{i=0}^{m} \omega_j \times k_j$$

where ω_j equals the share of total bank liabilities and equity represented by liability j, k_j equals the marginal cost of liability j, and m represents the number of various liabilities and equity the banking system uses to finance its lending activities.

[5]The Functional Cost Analysis program is a cooperative venture between the Federal Reserve and participating banks. The FCA provides Income and Cost data for commercial banks with up to $50 million in deposits, $50-$100 million in deposits, and over $200 million in deposits. The cost data for commercial banks with over $200 million in deposits was used in deriving the weighted marginal cost of funds and the single source marginal cost of funds. Fifty-six banks with over $200 million in deposits participated in the program, the largest institution having $4.6 billion in deposits. Since the nation's largest lending institutions account for a large proportion of student lending, the cost data from the FCA may not accurately reflect the non-interest costs of collecting those liabilities used to fund student loan activity. Given that larger institutions generally benefit from certain economies of scale and scope in generating liabilities, the FCA data may overstate the non-interest cost of funds to institutions making the majority of student loans. (See Appendix 1 for a more thorough discussion of economies of scale and scope in the banking industry.)

Weighted Marginal Cost of Funds
All Commercial Banks
(First Quarter 1990)

	Billions $	Share of Liabilities	Interest Cost	Noninterest Cost	Reserve Cost	Total Cost
Demand Deposits	278.9	9.19%	0.00	4.60	0.63	5.23
Other Checkables	287.1	9.46%	5.01	2.15	0.98	8.14
Saving Deposits	358.2	11.80%	5.25	2.28	0.23	7.76
MMDAs	191.7	6.32%	6.11	0.94	0.21	7.26
Small Time	534.5	17.61%	7.71	0.21	0.12	7.26
Large Time	399.1	13.15%	8.25	0.71	0.28	9.24
Borrowings	550.1	18.13%	8.17	0.71	0	8.88
Other Liabilities	226.4	7.46%	10.42	0.1	0	10.52
Equity Capital	208.9	6.88%	14	0	0	14

Weighted Marginal Cost of Funds = 8.62%

Notes:

(1) Liability data is available from the Federal Reserve Board.
(2) Interest cost data is available from Bank Rate Monitor and the Federal Reserve Board.
(3) Borrowings include federal funds, REPOs, commercial paper, and borrowing from the FRB.
(4) Other liabilities include subordinated notes and debentures.
(5) The interest cost foir other liabilities is 200 basis points over the 10-year Treasury bond.
(6) The cost of equity capital is derived using the CAPM theory.
(7) Non-interest cost information is from the Functional Cost Analysis of the FRB.
(8) Non-interest costs include overhead costs, labor costs, servicing costs, and the costs of bidding for public funds.
(9) Reserve requirements are 12% for net transaction accounts greater than $31.7 million, and 3% for nonpersonal time deposits with original maturity less than 1.5 years and Eurocurrency liabilities. All other liabilities have no reserve requirements.

In the single source marginal cost approach each asset is funded with a specific liability that has the same duration as the asset. By duration match funding the asset, the lending institution insulates itself from any interest rate risk associated with the loan.[6] The 4-year Stafford loan used as an example in the Department of Education's model has a duration of 3 months. This student loan can therefore be duration match funded with a three-month certificate of deposit (CD).[7]

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[6]To determine the appropriate liability to match with a student loan, the duration of a student loan must be derived. Duration is defined as the weighted average time over which the cash flows are expected from a loan, where the weights are the relative present values of the cash flows. It is a more accurate measure of the time dimension of a loan than its maturity. The maturity of a loan is generally misleading since some cash benefits of an investment are received well before the maturity date. The duration of any asset can be defined by the equation:

$$D = \frac{\sum_{t=1}^{N} \frac{C_t(t)}{(1+y)^t}}{\sum_{t=1}^{N} \frac{C_t}{(1+y)^t}}$$

where t is time, C is the cash flow from the asset at time t, and y is the yield to maturity of the asset.

[7]The assumption that a three-month CD is representative of the liability used by commercial banks to fund their student loan operations is conservative given that lenders are able to borrow directly from Sallie Mae. In the 1989 Consumer Bankers Association survey of lenders making student loans, 18.6% of the lenders were funded by Sallie Mae. Since Sallie Mae can borrow in debt markets at costs just marginally over the U.S. Treasury's borrowing costs, Sallie Mae can in turn offer lenders attractive rates. Moreover, Sallie Mae generally borrows heavily when market rates are low and lends at favorable rates to institutions when market rates are high and rising. This generates goodwill for Sallie Mae among lenders since it provides lenders with a

The total cost of issuing a CD for a lending institution equals its interest cost, the non-interest costs associated with issuing the CD, and the costs of holding reserves against the CD. In 1988, the estimated non-interest costs of raising retail CDs by institutions with over $200 million in assets as reported by the FCA was 21 basis points.[8] The Federal Reserve Board also requires lending institutions to hold 3.0% of their time deposits with original maturities of less than one and a half years in reserve. Given that the interest rate on three-month CDs was 8.24% in the first quarter of this year, the total cost of the CD to a lending institution would therefore be 8.45%.[9]

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relatively cheap way of funding their student loan operations. Sallie Mae advances are generally collateralized by student loans with a value equal to between 100% and 125% of the advance. Short-term advances have variable rates equal to between 85 and 150 basis points over the 91-day T-bill rate. As a first pass at the analysis, however, it may be propitious to abstract from Sallie Mae borrowings. This will become more important when comparing lender profitability across different asset categories. Special funding arrangements may be available for other asset classes, such as FHLB advances for mortgage lenders, that will be difficult to incorporate in the analysis.

[8]This may overstate the costs to larger lending institutions making student loans given certain economies of scale and scope that they may enjoy in generating liabilities. See the Appendix for a more thorough discussion of scale and scope economies in the banking industry.

[9]Using the interest rate on a three-month CD as the single source marginal funding cost may overstate the ultimate cost of funds to the lending institution. The three-month CD rate can be thought of a transfer price between the funds management group within in an institution and its lending group. The funds management group could, for example, quote a rate on a three-month CD to its lending group, but then in turn search for a cheaper lability to fund the loan. A funds management group could also mismatch the duration on the loan and the liability it buys to fund the loan, counting

In general, larger lending institutions use the single source marginal cost approach to measure their funding costs. The WMC approach can be highly subjective for larger institutions since the composition and cost of their incremental funds can be difficult to determine. Moreover, larger institutions are "liability driven." A liability driven institution originates loans and then searches for the cheapest source of funding. When a liability driven institution wants to make a loan it generally buys a specific liability to fund that loan.

Given that lenders of all sizes make student loans, the appropriate cost of funds to be used in the Department of Education's model of lender profitability should be an average of the cost of funds derived using the weighted marginal cost of funds approach and the single source marginal cost of funds approach. This is equal to 8.54%.[10]

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on a favorable shift in the interest rate environment. By assuming matched funding, however, this latter possibility is not considered in the Department of Education's analysis of lender profitability.

[10]This is the appropriate cost of funds for the first quarter of 1990. As interest rates change and the composition of bank liabilities change, lender's cost of funds will also change.

The Discount Rate

The appropriate discount rate to use in the Department of Education's model of lender profitability is the commercial banking system's cost of capital adjusted for the relative riskiness of student loans compared to other types of commercial bank lending.

The Cost of Capital

The commercial banking sector's cost of capital is defined as the average rate of return expected by providers of long-term funds. The capital structure of the commercial banking sector (the mix of long-term debt, preferred and common equity that compose total capital) at year-end 1989 consisted of one-quarter long-term debt and three-quarters preferred and common equity.[11] As of the first quarter of 1990, the after-tax cost of long-term debt and equity capital to the commercial banking sector is estimated to be 7.0% and 14%, respectively. (For a derivation of the cost of long-term debt and equity capital to the commercial banking sector see Appendix 2.) The weighted average of the cost of long-term

[11]This information is available from the quarterly Consolidated Report of Condition and Income for the Commercial Banking sector provided by the FDIC.

debt and equity capital for the commercial banking sector is therefore equal to 12.25% as of the first quarter of this year. This is the discount rate that should be used to determine the net present value of a loan of average riskiness made by the commercial banking sector.

The Risks of Student Lending

Student lending has a lower level of risk than other bank lending activities. In terms of credit risk, for example, bank credit cards have delinquency rates of between 300 and 350 basis points, prime-based commercial loans have delinquency rates of between 150 and 200 basis points, and auto loans have delinquency rate of between 100 and 150 basis points.[12] Although not all delinquencies result in default, it is apparent that credit risk is significant for nearly all bank lending activities. Given their federal government guarantees, however, student loans have no credit risk.

Student loans do have prepayment risk due to borrower default and borrower loan

[12]The source for the delinquency data for bank credit cards and auto loans is the American Banker Association. The delinquency data for prime-based commercial loans is the quarterly Consolidated Report of Condition and Income of the Commercial Banking Sector provided by the FDIC.

consolidation.[13] Given the relatively low interest rates paid by student loans borrowers, loan consolidation is not significant. In most cases, student loan rates on loans outstanding are well below market interest rates. While home equity loans could in certain interest rate environments be used more cheaply by borrowers given their tax advantages, it is unlikely that most individuals paying down on their student loans have enough equity in their homes to use a home equity loan to consolidate the rest of their borrowings.

The prepayment risk faced by lenders resulting from defaults by student loan borrowers is more significant. Based on information provided by the Consumer Bankers Association (CBA), the statistical life of four-year college loans is 58 months after the loans enter repayment. This is 14 months less than the contractual term of 72 months. Based on this portfolio of student loans, the prepayment cost for student loans is estimated to be 75 basis points.[14] It should be noted that this

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[13]Student loan borrowers have the right to pay off all or part of their loan prior to the maturity date. Payments made in excess of the scheduled principal repayments are called prepayments. The risk that a student loan borrower will prepay his/her loan at an inopportune time for the lender is called prepayment or option risk. The latter term is used because the lender has effectively granted the borrower a call option, much like the option bondholders grant corporations to call bonds prior to maturity.

[14]This prepayment cost represents the difference in the yield to maturity and the yield to call for a 4-year college loan. The yield to maturity is the interest rate tht will make the present value of the cash flows equal to the loan amount if the loan is not paid off until its maturity date. The yield to call is that interest rate that will make the

estimate of prepayment costs is only for four-year college loans and is based solely on the CBA portfolio of student loans, which may not be representative of the universe of student loans.

The prepayment cost of a student loan is therefore not subtantially different from the average prepayment cost of the commercial banking sector's entire portfolio of loans. The prepayment costs for a fixed-rate residential mortgage, for example, has ranged between 50 and 75 basis points over the past three years.[15]

Because the interest rate on student loans change every three months, they have little interest rate risk. Other loans made by lending institutions in general face greater interest rate risk. Although an institution can insulate its portfolio of loans from interest rate risk by duration match funding, most institutions are never

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present value of the cash flows equal to the loan amount if the loan is prepaid.

It is important to note that under certain conditions, lenders may actually benefit from a student loan default. Due to the high costs of servicing student loans relative to their loan size, which vary little over the life of the loan, and the significant decline in interest income accruing to lenders as the principal amount owed is paid down by the borrower, the net contribution (the difference between revenues and expenses) of the loan may turn negative later in the loan's life. This is illustrated in the revenue and cost estimates provided by the CBA. The net contribution of a loan that prepays 58 months after entering repayment, as calculated by CBA, is $332.29. This is greater than the net contribution of $326.34 for a student loan that does not prepay.

[15]The information on mortgage prepayment costs is made available by First Boston.

completely hedged against movements in the interest rate environment. Finally, student loans have very little or no liquidity risk given the willingness of Sallie Mae to buy loans.

The risks involved with student lending are clearly less than the risks associated with other types of bank lending. As such, the discount rate to be used in a present value calculation for a student loan should be significantly below the commercial banking sector's cost of capital. To measure this, it is reasonable to assume based on the previous discussion that credit risk is the only significant factor influencing the total risk level of student loans relative to other commercial bank loans. A proxy for the average level of credit risk in the commercial banking sector's loan portfolio is the ratio of nonperforming loans to total assets. As of the first quarter of this ratio, that ratio was 2.8%.[16] Taking the difference between the commercial banking sector's cost of capital (found to be 12.25%) and its average level of credit risk, the appropriate discount rate for a student loan for the first quarter of 1990 is 9.45%.[17]

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[16]The source for the ratio of nonperforming loans to assets is the quarterly Consolidated Report of Condition and Income of the Commercial Banking Sector provided by the FDIC.

[17]An alternative measure of the discount rate for student loans is equal to an interest rate spread over the commercial banking sector's cost of funds. The interest rate spread must be large enough to compensate lenders for the risk of making a student loan, namely prepayment risk. Adding the previously estimated commercial banking

Direct Expenses of Maintaining a Student Loan Account

The direct expenses of maintaining a student loan are largely accounted for in the Department of Education's model of lender profitability. The Department of Education's method of categorizing the expenses into one-time, monthly operational, and collection expenses is appropriate. One-time expenses include origination, marketing, and liaison expenses[18]; monthly operational expenses include customer service and monthly operating expenses; and collection expenses include costs associated with maintaining delinquent student loan accounts.

The Department of Education's model does not account for the expenses associated with providing for loan losses that a lender may incur. This should be included as a one-time expense of .04% of the loan amount.[19] Loan losses reflect bank management's estimate of the institution's exposure to credit risk in its lending activities. Although student loans are insured by the federal government against default, lenders may incur a penalty if they have not properly followed the due

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sector's cost of funds of 8.54% and the 75 basis points for prepayment risk, the discount rate is equal to 9.29%.

[18]Liaison expenses are those costs incurred by the lender from dealing the the guarantee agencies.

[19]The provision for loan loses on student loans of .04% is suggested by the CBA.

diligence requirements for making, disbursing, servicing, and collecting on loans.

The expenses used in ED's model of lender profitability are based on expenses associated with CBA's student loan portfolio. With average yearly expenses of $43.3 per $5,000 loan, CBA's portfolio of student loans have expenses of 87 basis points per year.

The Inclusion of Taxes

To maintain consistency in this analysis of lending profitability, ED should account for the tax liability associated with the net income earned from student lending. Considering taxes is important given that the marginal cost of funds and cost of capital are determined on an after-tax basis. The statutory marginal tax rate of 46% should be used in this analysis, although the effective tax rate may be lower. Lender's effective tax rates are dependent on a wide range of factors, including the timing of the recognition of interest income. Their determination would therefore introduce an additional degree of complexity and subjectivity to the analysis.

Most lending decisions, however, are based on profitability calculated on a before-tax basis. Moreover, when comparing the profitability of different lending activities

using this methodology, tax considerations become irrelevant. As such, ED may also wish to consider lender profitability excluding taxes.

Appendix 1: Economies of Scale and Scope in the Banking Industry

Two types of production economies may be achieved by financial intermediaries -- economies of scale, which are associated with the size of the intermediary, and economies of scope, which relate to the joint production of two or more banking services. Intermediaries realize economies of scale if technology allows production costs to rise proportionately less than output when output increases. Economies of scope arise if two or more banking products can be jointly produced at a lower cost than is incurred by their independent production.

Economies of scale and scope generally occur in financial intermediaries through the more efficient use of specialized labor, computer and telecommunications technology, and information (Clark, 1988). In a lending decision, for example, credit information must be gathered and analyzed. Once collected, however, this information can be reused in other lending decisions. Where the cost of reusing information is less than the independent cost of its production, reuse can help reduce the incremental cost of extending additional credit. If the information is reused to make similar loans to the same customer or to other customers in the same region or industry, it will provide a source of economies of scale. Alternatively, if the information can be used to make unrelated types of loans to the institution's

customers, it may also serve as a source of economies of scope.

Although the empirical evidence is somewhat mixed, more recent academic work has generally identified both economies of scale and scope in banking operations. Noulas et. al. (1990), for example, found that banks with assets of between $1 and $3 billion exhibited significant scale economies. Noulas found that diseconomies do occur in intermediaries with assets greater than $3 billion. Goldstein et. al. (1987) and Benston et. al. (1982) also found that significant scale economies for institutions with deposits of more than $100 million. Most academic studies have found that significant scale economies exist for institutions with less than $100 million, including Kim (1987), Gilligan and Smirlock (1984) and Berger et.al. (1987). Cost complementarities, a form of economies of scope, have also been found to be prevalent between different banking services. LaCompte and Smith (1986), for example, found significant cost complementarities between consumer and mortgage lending, and Gillian and Smirlock (1987) found cost complementarities between time and demand deposits.

Appendix 2: The Cost of Capital

The commercial banking sector's cost of capital is defined as the average rate of return expected by providers of long-term funds. The capital structure of the commercial banking sector (the mix of long-term debt, preferred and common equity that compose total capital) at year-end 1989 consisted of one-quarter long-term debt and three-quarters preferred and common equity.

Commercial banks are currently issuing long-term debt at rates ranging from 60 basis points above comparable Treasury securities for AAA rated institutions to nearly 250 basis points for BB rated institutions.[20] With the average spread currently near 200 basis points, the cost of long-term debt for commercial banks averaged 10.5% during the first quarter of this year. Based on a marginal tax rate of 34%, the cost of long-term debt to the commercial banking sector is 7.0%.

The cost of equity for commercial banks can be estimated using the capital asset pricing model (CAPM). According to CAPM, the required return to shareholders is represented by:

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[20]This information is provided by Salomon Brothers.

$$E=F+\rho$$

Where F is equal to the rate of return on a riskless asset and ρ is the risk premium on equity that reflects nondiversifiable market risk. The risk premium equals the product of bank stock's Beta (the ratio of the covariance of the return on bank stocks and the market return to the variance of the market return) and the difference between the expected return on the market portfolio and the riskless rate of return. Based on historical estimates, the Beta for all commercial bank stocks is approximately 1.2.[21] Since the average differential between the market return and the risk-free return over the past three years -- proxied by the S&P 500 stock composite index minus the 3-month Treasury bill rate -- is close to 500 basis points, the CAPM estimate for the cost of equity capital for commercial banks is 14.0% as of the first quarter of this year.

The weighted average of the cost of equity capital long-term debt for commercial banks is therefore estimated to be 12.25%. This is the discount rate that should be used to determine the net present value of a loan of average riskiness.

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[21]This information is provided by Value Line.

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Contributors

The analysis in this report was done by Dr. Mark M. Zandi, Managing Director, Regional Financial Associates, Inc., Paul Getman, Managing Director, Regional Financial Associates, Inc., and Dr. Sarah Jenkins, Assistant Professor of Finance, George Washington University.